



## The Errors of the Doctors according to Friar Roger Bacon of the Minor Order

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# The errors of the doctors according to Friar Roger Bacon of the Minor Order <sup>(1)</sup>

1. The ordinary doctor knows nothing about simple drugs, but entrusts himself to ignorant apothecaries, concerning whom it is agreed by these doctors themselves that they have no other purpose but to deceive. The apothecaries cheat them in various ways. One is in the price of drugs, and as a result the patients are overcharged. Likewise in the quality of the drugs : first, because they give old drugs for new ones; second, one thing instead of another, for example an artificial bone instead of the bone of the stag's heart (2), and wood in which aloes is growing instead of pure lign-aloës, and so on indefinitely; third, drugs from which the virtue has been extracted by decoction instead of those which still contain their virtue, as for example boiled lign-aloës instead of crude, concerning which AVICENNA clearly says, « Take crude lign-aloës » (3), and rhubarb is boiled down in the same way and the virtue extracted, and so on; fourth, adulterated instead of pure drugs, as adulterated balsam, *tyriaca*, musk, viper's flesh, and many others.

2. Then in regard to compound drugs they are entirely wrong, and there are thirty-six great deficiencies, and branching off from these an infinite number of subsidiary ones, some of which are

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(1) This translation has been made from the Latin edition of the *De erroribus medicorum secundum Fratrem Roggerum Bacun de Ordine Minorum*, prepared by A. G. LITTLE and E. WITHINGTON, in *De retardatione accidentium senectutis cum aliis opusculis de rebus medicinalibus*, 150-179, Oxford 1928. A translation by E. T. WITHINGTON of the first part of this work is in *Essays on the history of medicine*, edited by C. SINGER and H. E. SINGER, Zurich, 1924, p. 139-57, but BACON's interesting notes on drugs have been omitted; there are quite a few errors in translation, an inadequate system of reference to the works cited by BACON, and no critical footnotes.

The paragraph numbers have been added by the translator for convenience in indexing.

(2) For notes on the drugs mentioned by BACON see the *List of drugs* and the *Glossary of drugs (infra)*.

(3) Crude lign-aloës is prescribed many times by AVICENNA (d. 1037); e.g., « Recipe galiae et xyloaloës crude, » *Liber canonis de medicinis cordialibus*, Liber III, XIII, V, 12, Venice 1582.

common to simple drugs as well as to compound ones. One error is that there is no health unless humor is purged; but among the ordinary Latin doctors no drug is found for purging any inflamed humor except red choler. Although HALY SUPER TEGNI (4) says there are nine kinds of black choler: and he says in another place in the same work that all of these humors when inflamed cause many illnesses, for instance there are anthrax, fistula, cancer, lupus, erysipelas, and other very serious illnesses of this kind, and many other common ailments against which the doctors do not have enough drugs, thus many are efficacious but only a few cure.

3. The second main deficiency is that different authors say that certain simple drugs purge contraries, i.e., opposite humors, for instance HALY (5) says that senna purges red choler, and AVICENNA in the chapter *On fumitory* (6), that it purges inflamed humors, and the Latins that it purges melancholy. In the same way the Latins say that rhubarb purges choler, but the Greeks and ARISTOTLE (7), that it purges phlegm, and so on in the same way concerning the other contrary statements on this subject; and this latter is held to be true by the great doctor, and I myself use it (rhubarb) against phlegm according to the words of ARISTOTLE, but I do not use the gross substance since I know that it is better to extract its virtue, which the Latin doctors do not know, arguing on their side that in tertian fever rhubarb is given against choler, and so the sick one is both purged and made well. To which I reply what JOHANNES DAMASCENUS (8)

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(4) 'ALĪ IBN RĪPŴĀN (d. 1061 or 1067) a famous doctor of Cairo. BACON calls him HALY SUPER TEGNI because his most popular work was a commentary on GALEN's *Ars parva*, called *Super Tegni* by the Latins. This work was translated by GERARD OF CREMONA. G. SARTON, *Introduction to the History of Science*, I, 729, Baltimore 1927. BACON's references are to Haly Rodoam, commentator, Galen, Microtegni, II, V, 26, and II, III, 1, in *Articella*, Venice, 1491.

(5) 'ALĪ IBN 'ABBĀS, (d. 994) born in Persia. His medical encyclopedia was called in Latin *Liber regius* or *regalis*, hence his Latin name *Haly Regalis*. G. SARTON. op. cit., I, 677. For BACON's reference see HALY ABBĀS, *Liber medicinae dictus regalis*, II, II, 54, Venice, 1492.

(6) AVICENNA, « De fumo terrae », op. cit., Liber II, II, 27.

(7) R. STEELE, (editor) *Three prose versions of the Secreta Secretorum*, I, 70, London 1898.

(8) BACON is referring to SERAPION THE ELDER who lived in Damascus in the latter part of the ninth century. One of his medical compilations, the

says in his *Afforismus*, that any laxative drawing forth any other humor whatsoever also purges choler because the latter is not heavy and goes out easily. However, you should not consider this utterance as my opinion, but I only mention the contrary theories of the doctors concerning rhubarb in order that I may show you the failings of the doctors. Also you do not know how to extract the virtue from rhubarb, and therefore it is not necessary for you to be too much concerned in this part but to consider carefully what is useful. I desire now only to arouse, not to instruct you.

4. The third great deficiency is that when simple laxative drugs, in which there is something poisonous, are to be prepared by separating the poisonous from the useful, as for instance in the case of the serpent the venomous substance is separated from the flesh which cures all poison, the method of doing this is given much too briefly in the books of the Latins, and therefore many accidents are liable to occur. Thus in all kinds of rhubarb the useful part should be separated from the gross earthy material, and likewise in myrobalans and lign-aloes and in a great number of other drugs. But the doctors know nothing, that is the ordinary ones, except one in a thousand.

5. The fourth deficiency is that the relation between the quantity of noxious drugs and the human body is not known in this time, as for instance of scammony and opium and others of this kind, nor is the method of giving them known, nor in what quantities the men of this time should take them, nor the quantity which should be offered for each condition and age. Therefore death follows, or frequently a bodily insensibility, and various diseases, and through scammony a man may incur dysentery and death, and through opium, frenzy.

6. The fifth is that in regard to compound drugs they have no idea of the things which cancel each other, for example, if the beans of the *Malaca anacardium* are put in *tyriaca* they destroy

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*Practica*, or *Therapeutice methodus*, or *Breviarium*, was translated into Latin by GERARD OF CREMONA, and is the book referred to by BACON. G. SARTON, *op. cit.*, I, 608. For BACON's reference see, *Aphorismus* 82, « Quodvis medicamentum purgatorium necessario bilem flavam exagitat », IANI DAMASCENI, *Therapeuticae methodi*, Basle 1543.

the viper's flesh as AVICENNA (9) says; therefore a great many accidents occur through ignorance of this part of medicine.

7. The sixth is a result of the ignorance of the correct proportions of simple drugs in compound ones, and this is a most serious and terrible disaster. Because of this it should be *Maledicta* rather than *Benedicta* (10) which in the *Antidotarium* of the Latins is commonly said to purge phlegm; this is undoubtedly incorrect : because it is not able to purge phlegm to any great extent, although this book says so. For  $1/3$  diagredium purges more than  $3/3$  of the other substances for purging phlegm which are put with the diagredium in that *Benedicta* : whence that *Maledicta* purges choler and not phlegm, because scammony purges choler, which is too much in excess in the former, since it is put in in equal proportion with hermodactyls and the other drugs. And therefore the son of that ignorant Roman, who made the *Maledicta*, seeing his father's error, put in much of the drugs for purging phlegm, and called it *Benedicta transtiberina*, but this is not usually found in the books.

8. The seventh deficiency is in the fermentation of drugs, because as AVICENNA says (11), compound ones are not of any value without fermentation, and this fermentation takes place during an interval of time. But concerning this no definite theory has been evolved, except that an opiate drug should not be brought forth before the end of six months. There are certain ones which can be finished in less time, as may be found in SERAPION'S (12) book. But time alone does not cause fermentation unless some other device is used along with it, because neither the narcotic in an opiate nor diagredium in a laxative is fermented with its simples unless it is reduced to one single substance. In order that this may be accomplished, three things are necessary : a certain amount of time, a well-mixed substance, and the dissolution of the poisonous material; and this is the secret of secrets of which all the common doctors are ignorant.

9. But it would take too long to go through all the other deficiencies up to the 36th, and longer still to follow out all their ramifica-

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(9) AVICENNA, *op. cit.*, Liber V, preface, p. 972.

(10) See *Glossary of drugs*.

(11) AVICENNA, *op. cit.*, Liber V, preface, p. 972.

(12) IANI DAMASCENI, *op. cit.*, Liber VII, 6.

tions, nor am I able to do so; and therefore I shall pass on to the extrinsic deficiencies.

10. These, then, are the faults on the part of common knowledge itself and those on the part of the authors, who have not discussed these things clearly, and especially in the books which are written by the Latins. There is another deficiency concerning those things which the Latin doctors ought to use, because they do not have rhubarb senith, nor hepatic aloes, nor citrine aloes, nor birthwort, nor the flowers of the squinanth which alone among hot things repels, nor yellow oil of rocks, nor pure balsam, nor pure musk, nor pure lign-aloes, nor viper's flesh, nor oil of sesame, nor a great many other things which are of the greatest value in medicine.

11. But nevertheless there are other serious hindrances to the acquisition of knowledge on the part of ordinary persons. One is the ignorance of the languages in which medicine is discussed. For the authoritative works are full of Arabic, Greek, Chaldean, and Hebrew words, so that it is impossible for anyone to understand what the authors mean, as is shown in many places, and because they are ignorant of the Greek and Arabic and Hebrew languages from which an infinite number of words in the Latin books are taken, and because of their lack of knowledge they are not able to understand drugs nor how to make them.

12. Another deficiency is due to the ignorance of simple drugs because the doctors do not know them nor the prices of the things which they use, as was mentioned above incidentally, because it was one sign of their ignorance of drugs. Because old drugs instead of new ones, and one in place of another, and drugs from which the virtue has been extracted for those still containing their virtue, and adulterated for unadulterated things, are frequently accepted by the doctors, as I have already shown.

13. The third deficiency is that the ordinary doctor spends his time in discussing an infinite number of questions and in useless argumentation, and has no leisure for gaining the experience which he should have. Thirty years ago there was no time for anything but experience which alone taught them; but now by means of the *Topica* and the *Elenchi* they multiply an infinite number of incidental questions and dialectic arguments and countless sophistries, in which they are so completely buried

they are always seeking but never learn the truth. For learning comes by way of the senses (13) of memory and experience, and especially in the practical sciences, of which medicine is one.

14. The fourth deficiency is that they do not observe the heavenly bodies upon which every change of the lesser ones depends; laxative drugs and flebotomy and other evacuations and constrictions and the whole system of the medical art is affected by the atmospheric changes caused by the heavens and the stars. Therefore, the doctor who does not know how to observe the places of the planets and their appearances cannot accomplish anything in the practice of medicine, except by chance and good luck. This is discussed by the medical authors, namely HIPPOCRATES (14), GALEN, CONSTANTINE, RHAZES, HALY, and ISAAC (15); and is also clearly advised in very definite words by experienced doctors who know astronomy. It also is quite obviously taught by ARISTOTLE (16), PTOLEMY (17), and all excellent astronomers. However it would take too long to explain all of this. But the ordinary doctors of our time, seeking chiefly a most evil and disgraceful consolation for their ignorance, contradict these authors and the experienced doctors, and philosophers, and the senses, because a great many dangers crowd in upon reason in this matter.

15. The fifth deficiency is that they are ignorant of alchemy and agriculture (18); while on the contrary it is quite evident that practically all simple drugs are discussed in these two subjects. There are a great many difficulties which arise on account of the lack of knowledge of alchemy, because when the art of medicine teaches the use of the virtues of drugs without the substance, and it is necessary to do this in an infinite number of cases on account of the whole mass of poisonous earthy material, no distinction between them can be made except by means of alchemy which alone gives the method of extracting each virtue from

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(13) Cf. ARISTOTLE, *Metaphysica*, Book I, chapter I, in *Works of Aristotle*, translated by J. A. SMITH and W. D. ROSS, vol. VIII, Oxford, 1908.

(14) HIPPOCRATES, *De aere, aquis, et locis*, in *Opera omnia*, I, chapters I and II, Naples 1757.

(15) ISAAC ISRAELI THE ELDER (d.c. 932). G. SARTON, *op. cit.*, I, 639.

(16) ARISTOTLE, *Secreta*, I, 64-65.

(17) PTOLEMY, (d.c. 161) *Quadripartitum*, four books on the influence of the stars.

(18) Agriculture here means botany.

any substance whatsoever; because it is necessary in working with drugs that there be resolutions and dissolutions of one thing from another which cannot be made without the aid of alchemy which gives the method of resolving any one substance from any other.

16. There are numerous examples of this : for instance, from the kinds of rhubarb used for purging phlegm the virtue alone should be taken and not the whole substance, of which fact practically the whole world of doctors is ignorant; although it is a most beneficial thing and especially good for the human body, and among all medicines it alone strengthens the natural heat and invigorates the body, just as is shown by ARISTOTLE in the *Secreta* (19), and I too have observed this in my own body. For every other drug weakens either a little or a great deal as everyone knows, and this alone strengthens. There is practically an infinite number of other similar examples (of drugs) from which the virtue should be extracted in order that they may be taken easily and without danger, as is shown in books dealing with drugs. But not only should the useful virtue be separated from the substance, but also the poisonous virtue from the useful substance, as for example in viper's flesh, in the head of the dragon, and in many others, it is necessary not only to extract the poisonous virtue but also other useless things, and not only this but it is also necessary to make a variety of resolutions of bodies from other bodies, as in the extraction of elements of various kinds, and various kinds of water and many other things, and whether those substances from which they are extracted are altogether useless, or poisonous, or indifferent, or useful for many other purposes. For thus by means of alchemy is extracted the blessed oil from bricks, rose water from roses, *et cetera* which can and should be much improved by alchemical methods rather than by the untutored. Again many drugs should be sublimated, just as AVICENNA (20) and others have clearly told us.

17. In addition to these and similar ways in which alchemy is useful in medical practice, the application of its methods is

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(19) ARISTOTLE, *Secreta*, I, 70.

(20) AVICENNA, « De argento vivo. ... Sublimatum est stypticum... Argentum vivum sublimatus est interficiens propter vehementem incisionem, » *op. cit.*, Liber II, II, 46.



always valuable in medical theory and highly necessary, since it explains inclusively the entire development of things from their elements through the simple humors and then composite ones even up to the parts of animals and plants and men, as has already been touched upon; medicine does not explain this development but constantly sends the doctors to alchemy, as is shown by AVICENNA (21) in many places, and by other authors of medical works. Whence this alone of the sciences, that is alchemy, dares to explain what are the first four elements, then the second four, and a third four, up to twelve, from which man and the whole lower world are made. Whence there are twelve corporeal substances which have within themselves the power to determine the species of things and exist in the world *per se*, and the natural philosopher deals with only four of these elements. However the doctor, although he touches upon these things does not explain them but sends the medical students to alchemy, as is shown by AVICENNA in the first Canon (22), the one in which he disagrees with GALEN, who says that only blood flows through the parts of the body which need nourishment. For he shows that the other humors are necessary for many reasons, and after putting forth his arguments, he confirms what he has said by means of alchemical experiments, saying, « We also find blood mixed with other humors which are distinct from it. When moreover it is extracted and by degrees is put into an *atuum* or an *egem*, which are vessels used in distillation in alchemical experiments, by observation it may be seen that it is separated into a part which is like froth and is red choler, and a part which is like dregs and is thick and melancholic, and a part which is like the whites of eggs and is phlegm, and a moist part which is the watery substance whose superfluity is evacuated in urine, (23) » and in the following chapter he says, « That if all these things are

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(21) Especially in the prefaces to Libri II, and V.

(22) Although AVICENNA does not always agree with GALEN in this chapter, BACON is not correct in implying that he disagrees with GALEN in this particular passage, « Inquit Galen ille, qui dixit, quod humor naturalis solummodo est sanguis : et alii humores sunt superfluitates, quibus non egetur, non dixit verum, » *op. cit.*, Liber I, I, IV, 1.

(23) This is a direct quotation from AVICENNA, *op. cit.*, Liber I, I, IV, 1, lines 7-11.

compared, that which is quite warm is blood. (24) » And these humors are in the first place four simple ones each of which is composed of four elements but one element predominates; and then there are four composite humors, each consisting of four simple humors, but from one of them on account of its predominance, as in a choleric man or a choleric member, there comes a composite humor which is called choler, and yet is composed of all the simple ones but called by the name of the controlling humor; and also from the bloody man or member, comes the blood made up of all humors, but it takes its name from the one which is superabundant, and so on concerning the others.

18. Therefore for this reason and for countless others, alchemy is necessary in speculative medicine in order to become acquainted with the generation of things and with the properties of natures. When AVICENNA in his second Canon argues against GALEN concerning the generation of quick-silver he says, « GALEN thinks that quick-silver is made only from cinnabar in a vase smeared with clay, above which a fire is burned and thus it is sublimated (25) » but this is not true; on the contrary cinnabar is made from quick-silver with sulphur, and then it is possible to extract it from quick-silver just as it is extracted from mineral cinnabar. And thus I have treated of the science of alchemy, according to the words of AVICENNA in his letter to HASEN concerning the value of alchemy, in which is shown the generation of cinnabar from quick-silver and sulphur. But it would take too long to enumerate the uses of alchemy in its relation to both theoretical and practical medicine; therefore let this be enough for the present.

19. The final condition which shows the lack of knowledge on the part of the ordinary doctors, is their ignorance of natural philosophy. For ARISTOTLE says that where natural philosophy ends, there medicine begins, and natural philosophy will give the first principles of health and sickness, as he says (26). That

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(24) Here again BACON quotes exactly from chapter II of Liber I, I, IV « Quod autem de hoc toto res colata est, quae est bene cocta, est sanguis, » a line which in turn is a quotation from Galen, Liber IV, c. 5.

(25) AVICENNA, *op. cit.*, Liber II, II, 46.

(26) ARISTOTLE, De sensu et sensibili, I, in *Parva naturalia*, Part I, in *Works of Aristotle* vol. III<sup>2</sup> translated by J. I. BEARE, Oxford 1908.

natural philosophy is unknown not only to the Latin doctors but also to all ordinary philosophers, can easily be shown; and likewise with this in the same way can be shown their ignorance of metaphysics, although all mediocre modern students brag about their knowledge of these two sciences : and because this is stated principally with respect to the philosophical errors which abound in theology, I therefore wish to determine this point more clearly. Just like the bachelors and masters of arts in this period are the theologians, and on account of the ignorance of these two sciences the whole study of theology is being destroyed in its foundation, and in the same way, the study of medicine : since the theologians are much too eager to introduce these two sciences, as will be touched upon below, and likewise the doctors seize and steal whatever they can understand concerning natural philosophy. But in these days it is impossible for natural philosophy and metaphysics to be understood; a sufficient proof of this is that there is no agreement in anything. According to ARISTOTLE in the *Metaphysica* (27), this is an absolute sign of ignorance.

20. But there are many reasons for this. One is that the ordinary students of these subjects have nothing to use except the books of ARISTOTLE which they cannot understand, mainly because of their strangeness. For these sciences have been generally taught for only about twenty years, and textbooks have not yet been compiled. For although logic has now been in use for 300 or 400 years or more, up to now it has not been understood because one writer never agrees with another in even the most worthless sophism. But I do not wish to linger over the ignorance of logic, since it will be proved below that nothing worthwhile is known concerning it.

21. In the second place natural philosophy is unknown on account of the incongruities in translation : if one person says that ARISTOTLE meant a certain thing, another says that he meant the opposite, as is known to everyone. Third, because of the imperfection of the translation which is used, since an infinite number of lines are left out as is shown by the Greek original, and even whole chapters and many books; so that only about half of the books dealing with these two sciences written by

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(27) ARISTOTLE, *Metaphysica*, Book III, chapter III, in *op. cit.*

ARISTOTLE have been translated into Latin. Because ARISTOTLE wrote fifty books concerning animals, as PLINY says (28), and I have seen in Greek those which are not in Latin; we have not more than nineteen books. Practically all of the books concerning plants are lacking, especially in a translation which is readable, as is clearly shown in the translation by MICHAEL SCOT (29), but beyond that we have very little. The book concerning inanimate objects is entirely lacking, because the few chapters which are added at the end of the *Metheora* are not from the text of ARISTOTLE, as is known from another translation.

22. Because although in the book which is called *Lumen luminum* (30), which many ascribe to ARISTOTLE, there are said to be twelve corporeal substances for the natural generation of various species, that is four elements and eight others, this cannot be learned in ordinary philosophy, neither do the doctors explain it nor can anything be determined concerning them from their own nature : and therefore AVICENNA in his chapter *On humors* (31) refers the doctor to the methods of alchemy in his argument against the theory of GALEN that the blood alone nourishes the body; and elsewhere in the same chapter and in the following one, and in many places he touches upon these things which are based upon this sentence which is found in *Lumen luminum*. Therefore it is necessary that only by means of universals is known the first cause of the generation of the nature of things in most books, and not by particulars, nor with any certainty because this latter is more by means of experimentation than by argumentation. For ordinary natural philosophy deals with everything by means of universals, and by means of narration in many things, and argumentation in others. But it does not treat of the particular, it does not advance by means of experimentation on account of which it does not give proofs; but specu-

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(28) PLINY, *Historia naturalis*, VIII, 16, Venice 1476.

(29) From many passages in his works we know that ARISTOTLE intended to write a separate treatise on plants, and it is probable that he wrote one. But there is only a small work ascribed to him by some, but usually classed as spurious. However there are many passages on plants in his other writings. T. E. LONES, *Aristotle's Researches in Natural Science*, 95-101, London 1912.

(30) As this was a title given to several alchemical treatises it is not certain which one was referred to by BACON.

(31) AVICENNA, *op. cit.*, Liber I, I, IV, 1.

lative alchemy determines by means of particulars all the primordial generation of things from elements, humors, and other things, as has been said. Then by means of particulars are found all the kinds of inanimate bodies even including the composition of the parts of plants and animals. For practical alchemy releases the secret of secrets concerning the parts of plants and animals, which ARISTOTLE (32) explained to ALEXANDER, by which it is possible for base metals to be changed into more valuable ones, and for greater things than this to be done. Philosophical agriculture also shows by means of particulars and by experimentation, the generation of plants and animals from first principles, and according to the whole but not according to the parts. But these two sciences are not used by the ordinary students, although many books concerning each are possessed by the Latins: and so there is a great deficiency in Latin learning, and many useful things in that field are neglected.

23. But although many things are certain about medicine, yet among the Latins there are many defects in this respect; nor is it to be wondered at since it is hazardous to experiment on the human body, also extremely difficult, and therefore it is harder to work in this science than in any other. Therefore excuses should always be made for doctors even though they must make many mistakes. For creative and experimental sciences whose experiments are made on inanimate objects can be retested many times until all the faults and errors are cast out. But the doctors are not able to do this because of the superiority of the material on which they are experimenting; because that body requires that no mistake be made in experimenting upon it, and so it is difficult to experiment in medicine. But one cannot arrive at the truth except by means of experimentation, therefore the doctors are excused when they make mistakes, more than other experimental scientists.

24. The indications of their faults are of the following nature, namely, there are disagreements among the doctors concerning the methods of healing, and also stupors and deaths often occur in their practice. Likewise the ordinary people who do not use drugs are stronger, better looking, and have a longer life, or

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(32) ARISTOTLE, *Secreta*, I, 88-91.

greater longevity, than those who are addicted to the use of medicine; this is especially evident in the northern countries where the use of drugs is rare and infrequent. Therefore they are handsomer, stronger, and have better bodies and spirits than the other peoples who use a great deal of medicine, and they live longer : the exact opposite of this would necessarily be true if the use of drugs were perfectly understood by the doctors, and if all drugs and likewise all artificial compounds were prepared in the right way and given to each person in proportion to his age and physical constitution, and the horoscope of each, which changes the entire bodies of all men and all things every hour; and according to other special conditions which are known to each intelligent doctor, and also if they were given where necessary, and not elsewhere and if the appropriate drug and no other were given, i.e. not one drawing forth one humor instead of another, but the humor which is superfluous and is causing the illness : of necessity the contrary would be true, namely, that the use of medicine would bring about a longer life, a stronger, more animated and handsomer person than if medicine were not used. These therefore are the faults of the doctors.

25. The causes of these defects and their ramifications are numerous, and I shall discuss those which are well known to each doctor after he has had experience in the practice of medicine. First, the Latins do not have a sufficient number of diagnoses of diseases; because only AVICENNA (33) gives diagnoses, and, to some extent, RHAZES in his *Divisiones* (34). But these diagnoses are not sufficient, as is clear to everyone, and AVICENNA, as the translator of his book says, was a philosopher and not a doctor, and at the end of his translation he deplored the work he has done on it, especially since he found the books of RHAZES and others filled with practical as well as theoretical medicine. Hence the Arabs have not used to any great extent the works of AVICENNA, but have used those of other writers, and the Latins who practice according to his book often make mistakes, as experienced people know. Therefore RHAZES put the diagnoses of diseases among

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(33) AVICENNA, *op. cit.*, Libri III and IV.

(34) AL-RĀZĪ, (d. 923-24). *Continens*, in *A treatise on the smallpox and measles*, translated by W. A. GREENHILL, London 1848.

the first duties in the practice of medicine, so that the causes and symptoms of any kind of illness might be clearly recognized, for example in the symptoms of quartan and of dysentery, and of others, because one symptom comes from one cause and has its own definite characteristics and its own cure. This is the first and principal source of trouble, but this is not made evident in the Latin books.

26. The second source of trouble is that when they have reached the question of the cure, assuming that they know what are the diagnosis of the disease and the causes and the symptoms, the Latins lack many drugs, both simple and compound, or they have received from other countries adulterated ones, or they are not in use among the Latins although they have them. For example, there is rhubarb senith, which is Indian rhubarb, and is far better than Pontic rhubarb and *reu barbarum*, which is not found at all among the Latin apothecaries, although it is most useful to the human body; in this is ARISTOTLE's secret concerning the conservation of the health of ALEXANDER, because it is the life of the liver, as ARISTOTLE said (35), and it strengthens the natural heat which is not done by any drug except this. Thus it strengthens the body and fortifies it against the effects of other medicines, and this has been learned by experience, if it is correctly prepared and taken in the correct way, in which lies the great secret. And so on concerning innumerable others both simple and compound.

27. Viper's flesh, although it is one of the important medicines, as ARISTOTLE said (36) and as the experienced doctors know, is not in use among the Latins, nor is it easy to obtain it in a pure state. Because it can be adulterated in many ways, and it may be made from other serpents, and many imported drugs are adulterated and it is only by a few kings that pure drugs can be found in the necessary quantity, such as musk, balsam, and others of this nature. Lign-aloes is adulterated and boiled and the virtue taken out, and the wood which contains hardly any virtue is sent to the Latins, and also Pontic rhubarb and *reu barbarum* and many others. And the most renowned one

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(35) ARISTOTLE, *Secreta*, I, 81.

(36) *Idem*.

which ARISTOTLE praised above all other compound medicines is not to be found by any method, nor the eight drugs which are required for it, as it is given in the *De regimine vite*; and so on time after time concerning the other compound medicines.

28. And the third hindrance, supposing that they can obtain drugs of this kind from the regular apothecaries, is that the ordinary doctors are not able to do anything but trust them. And therefore the apothecaries give them old things for new, spoiled instead of good things, for example, some other bone instead of the bone of a stag's heart, and thus in a great many ways are the doctors cheated, not only in the quality of drugs but also in the price, as was said above. This is what makes things especially difficult for them; nor is there any remedy for this, unless one is powerful and wealthy and can supply and prepare everything himself or with the help of the people in his own home.

29. The fourth hindrance, supposing all the other difficulties to have been set aside, is that up to this time the medical authors have not given the remedies for many illnesses in the books of the Latins: for example, HALY SUPER TEGNI (37) says: Humors whenever they are inflamed and changed into a black choler, are of the yellow variety of choler and the phlegm is salt and the humor melancholic and bloody; therefore there are nine kinds of black choler, six inflamed ones for each of the yellow kind, and one of the salt phlegm. Also there are many kinds, pure and impure, the pure is a nourishing medicine for the body, the impure is that which is poured into the veins: and it is said in the first place in that same book, that there is produced from each one of these humors whenever it is inflamed, many illnesses, for example, anthrax, carbuncles, lupus, quartan, and many others, for which the symptoms are not given by the authors, just as in many other cases. But the authors of the Latin books have only a very few drugs which have been tested and proved, and almost none at all which cure. Although many are beneficial, very few or none at all cure these serious illnesses, as is shown by the prevalence of these maladies throughout the whole world.

30. The fifth deficiency is that it has not been shown by the authors of the Latin books concerning the known drugs and

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(37) 'ALĪ IBN RİDWĀN, *Super Tegni*, II, V, 26.



those which are used daily, which humor they purge, as has already been said. For example, HALY (38) says that senna purges red choler; AVICENNA, in the chapter *On fumitory*, that it purges inflamed humors; the Latin teachers, that it purges melancholy. In the same way there are differences of opinion concerning rhubarb. ARISTOTLE (39) says that it purges phlegm, and so do the Greeks. No medical author says in the Latin books what humor it purges. But the theory of the Latin doctors is that it is choler, and so on concerning many others. And therefore great danger arises.

31. The sixth difficulty is in the preparation of simple drugs. Because it is necessary that many be prepared by alchemical methods, for instance, many oils and health-giving waters, and many other beneficial things, by means of distillation. And if they are prepared by the correct methods of alchemy, they will be of far greater virtue. Second, it is necessary because in many cases the virtue must be extracted from the gross earthy substance, which is very poisonous to the body, as for instance, in the case of *reu barbarum*, and myrobalans, and lign-aloes, and many others, in which a part of the extracted virtue cures efficaciously and successfully, and without harm, as experience shows. Third, it is necessary because some are poisonous, such as mercury and many others, so that they require correction by means of sublimation and other processes, in order that their harmfulness may be lessened to some extent. In the fourth place it is necessary because what is taken in the greatest drugs, that is precious stones, gold, and silver, which ordinarily when given in medicine, pass through the body and do not linger, and because of this there is little or no value in them, although they are taken in large quantity, because they can neither be assimilated nor dissolved, while they remain in their gross and hard substance before calcination or dissolution in water; and therefore they pass through. But if they are prepared by the secret method of alchemy, that is, if they are calcinated and dissolved in water, so that they are well prepared, especially with the aid of experimental science, they can even in small quantities aid the human body, beyond

(38) 'ALĪ IBN 'ABBĀS, *Liber regalis*.

(39) ARISTOTLE, *Secreta*, I, 70.

all expectation. In the fifth place, by the same means, with the aid of another science, many substances are reduced to primary matter, concerning which ARISTOTLE speaks in the eighth book of the *Metaphysica*, and as is written at the end of the *Metheora*, they will be able to cure the human body more than is believable. But these things are hidden because the said science, or the said sciences, are not used by the doctors. In the sixth place, this science is needed in order to make many medicines, not only for preparing them, according to what GALEN teaches in the *Dinamidiarum* concerning the composition of calcined copper and AVICENNA contradicts him concerning the composition of minium (40), and PLATEARIUS (41) shows how to make certain things, and also many other authors in whose writings are shown the practice of this science.

32. And if we run through the list of compound medicines we shall find greater difficulties. For there is an almost infinite number of drugs which cannot be mixed together so that one drug may be made, and one compound. For only opposites have a common medium, although this is doubtful, because then each of the opposites has only two extremes, as ARISTOTLE says and demonstrates in the fourth book of the *Metheora* (42) : three or four or more do not make a mixture, as anyone may easily argue. And yet ARISTOTLE says in the same book that only opposites have a medium, and every medium is made up of opposites, and thus it is not easy to know the truth in this case. Besides, one opposite which is superior often destroys the others, nor does it submit to the mixture, and so there is a great loss in the combination of drugs, especially since the authors do not solve this difficult question, and those who make these things have no skill in this art.

33. In the second place there are three difficulties in regard to proportions. One is in the proportion of a base and the other

(40) AVICENNA, *op. cit.*, «De syrengi, i. Cinnabari. Syrengi quid est : Est proximus virtuti asedinegi, immo est fortior.» *Syrengi* is minium. Cf. GALEN Liber IX, 59 f.

(41) JOANNES PLATEARIUS THE YOUNGER, a physician living in Salerno in the latter part of the eleventh century. His Compendium was called *Practica brevis*. G. SARTON, *op. cit.*, I, 770.

(42) BACON is incorrect in this quotation. He was probably referring to the *Metaphysica* IX, chapter VII.

things which are put with it, so that the correct proportion of each may be known in every medicine; and this is a very difficult question and one which is unknown to the ordinary doctors. The second difficulty is to secure from the mixture the degree of heat and other qualities which you desire, just as in simple medicines, and this cannot be determined except by the method which ALKINDI (43) teaches concerning degrees, a method which is very difficult and completely unknown at this time to the Latin doctors, as every one knows. For whoever wishes to perfect the science of the philosopher mentioned above, must know well the general principles of mathematics on account of the nature of the greater and lesser inequalities, and on account of the nature of the proportions, and on account of the very difficult laws concerning fractions, which were used by the author mentioned above. The third difficulty is that, even if in the two above mentioned cases, no defects exist, there is a third one at hand. Because the arrangement of the heavens is changed about every one hundred years, and therefore all things born on the earth change their complexions, and human bodies also (44); and therefore the same proportions of drugs should not always be continued as they were given in the books of an earlier period, but definite calculations are required according to the lapse of time. But who is able to know the degrees of each change? Certainly not a mere physician, nor even one learned in astronomy, unless his knowledge be perfect.

34. Besides, fermentation is required in compound medicine, because compound medicines will be of no value without it, as AVICENNA says. For compound medicines must be made according to their own natures and not according to the nature of simple ones; and because of this a long process is required for them, in order that they can remain in the one virtue which comes as a consequence of all the others, but this period of time for medicines has not been determined among the Latin authors. Because some take several days, others several months, some one month and some one day, and whatever may be the number

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(43) AL-KINDĪ (d.c. 873). The work referred to here is quite evidently the *De medicinarum compositarum gradibus investigandis libellus*. Cf. G. SARTON, *op. cit.*, I, 559.

(44) Cf. AVICENNA, *op. cit.*, Liber I, I, III.

of days or months is varied in many ways, nor can this be determined except by long practice; and because this fermentation is necessary, therefore when it is not used in each medicine according to its own nature, there is great loss.

35. Besides all of these there is another principle source of trouble which does more harm than any other, and more than many others together, and this is that signs of the times are not observed, as was mentioned above. Each hour has its own nature, and each quarter of a day, and each day, and so on : and not only do they have natural and common natures, which occur continuously on account of the motion of the sun and moon and fixed stars which move around above the zenith of the head; but also they have natures which change according to the movement of the other planets and according to the variety of the conjunctions and appearances. And not only do the seasons have this but also humors and the complexions of nature and all things which are born and decay, and therefore it is necessary that the doctors know how to take into consideration these changes in the body upon which they are working, and in the things which they are using. Otherwise they will make mistakes in all their work.

36. This therefore is the reason for these statements; but experience proves the same thing, and moreover all the medical authorities have found this to be true, as was noted above, and all the learned astrologers such as ARISTOTLE, PTOLEMY and others; and the doctors who are skilled in astronomy most certainly know this, and even the ordinary doctors use this in their practice and in all things in which it is possible, they observe the sun and moon and the changes of things caused by them, although they have no scientific knowledge concerning these things, but it is evident that each one does these things for himself, according to custom and use. But if any author says a doctor, inasmuch as he is a doctor, should not prove these things, as AVICENNA and HALY (45) have said in a certain place : first it is that they themselves should not contradict them, when in some other place they may be willing that the doctors should make use of

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(45) AVICENNA, *op. cit.*, Liber I, II, III, 3, «De naturis temporum». HALY, *op. cit.*, I, I, 2.

the contemplation of the heavens. And therefore they wish that the doctor, inasmuch as he is a doctor, neither can, nor should, have to take these things into consideration: but still it is necessary that they should do this by means of the study of other sciences, because their labors are based not only on a knowledge of medicine but on many other sciences, and especially on three, of which one is alchemy; second, of more importance, astronomy; and third, most important of all, the one concerning which we shall speak later.

37. But these difficulties in the practice of medicine are not the only ones, but others arise on account of the lack of languages, a subject which has already been discussed. Although this is universal among the Latins, it is especially true in the medical practice, because of the many words of other languages which are retained in the latter, and because of the hindrances of this speculation concerning which I shall add a few words.

38. Knowledge gained by practice is in all sciences of greater use than this speculation, although not according to the teaching of the method. For through the admiration of the results of experiments we are aroused to a study of causes. And therefore the practice of each science is by use and not by theory or speculation. Therefore speculation concerning the causes is necessary before we are able to know exactly the practice: but medical speculation depends particularly upon many sciences. For example, philosophical agriculture gives a knowledge of simple medicine which exists in plants and animals. Alchemy reveals the simple medicine which is found in inanimate things. But these two sciences are not known by ordinary people, not only doctors but all students: because not only are the inanimate and animate things which are in the medical books unknown, but also many of their words which, according to the nature and meaning of the word, are taken from the books on alchemy and agriculture. Natural philosophy, especially concerning the heavens, is very necessary in order to recognize the complexions of the places of the world and the times and, as a result, all medical things.

39. Now follows experimental science whose first merit is, as I have previously proposed, that it in itself gives complete proof concerning the conclusion of other sciences. For theoretical knowledge does not give the proof of its conclusions, but only

the principles, as ARISTOTLE (46) says at the end of the *Posteriora* and at the beginning of the *Metaphysica*. Other sciences, which are practical, although developed by means of experiments in respect to their conclusions, yet these experiments are either universal, or, if they are particular, are incomplete in respect to the final experiments, upon which this science is based: and without a testing of conclusions there never will be science. For evidence as a demonstration proves the truth of a conclusion which no one is able to refute, but not on this account does his mind rest in the light of truth: experiments are continually being demanded, and then the truth is comprehended without complaint or hesitation. And therefore since science is the ascertained knowledge of truth, truth is determined by proofs, but doubt is not hindered, however not by this is the certainty of facts brought to light before experimentation is added. And everyone has found this to be true in an infinite number of cases. Although everyone learns by proofs which he is not able to refute, and accepts the fact that fire is hot, yet not because of this does he shrink from putting his finger into the fire before he has experienced the pain; after this has been done, his mind is at rest in the knowledge concerning the strength of burning heat, and he avoids the effect. Because since the first demonstration of EUCLID is the most important, when it is stated that all lines drawn from the center to the circumference are equal, and each side of a triangle constructed upon a given line with the line of the same kind and therefore equal to each other, because things equal to the same thing are equal to each other, therefore that triangle must be equilateral: the mind of the listener is not at rest concerning this truth before the experiment of the figure of two circles intersecting each other, from whose intersection on both sides are drawn two lines to the extremities of the given line, but not because of this (demonstration) is this fully proved, unless there is in addition a particular experiment by measuring. And therefore when ARISTOTLE (47) says that demonstration is the logical method of producing knowledge, it may be proved by

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(46) ARISTOTLE, *Analytica posteriora*, Book II, chapter 19, in *Works of Aristotle*, vol. VII, translated by G. R. G. MURE, Oxford 1926.

(47) *Ibidem*, Book I, 87b-88a.

its own experiment : whence he does not use this word absolutely and merely for the exclusion of any other one whatsoever, but for the exclusion of other kinds of proofs, those which are not of an experimental nature, and thus it is according to natural law. For anyone by means of an experiment, no matter how ignorant he is concerning the attraction of iron on becoming magnetized, can effectively prove by evidence that this attraction is possible in nature, although it has not yet been verified, unless he has seen it with his own eyes, so that each one may know it for himself. Because not so much by authority nor by reason, as by experimentation may we work this out, and then the mind is at rest.

40. It is said that tablets and pills purge the remote parts, because they lie for a long time in the stomach, and liquid substances, near ones. But in that case violet, if it were given in tablets, would purge the remote parts; purging cassia and tamarind and other light medicines of this sort and heavy medicines in liquid substances would purge distant parts, and this is not true. There are pills and tablets into which aloes is put because it is too bitter, nor could it be taken in a liquid substance on account of its bitterness : and aloes is better than honey according to the opinion of Master SIMON (48), because it has an affinity with the parts of the head, and he has proved by experimentation that aloes is more efficacious than honey.

41. The doctors of Salerno say that scammony should not be ground too finely, lest the powder adhere to the stomach, and lest it become so hot that the virtue leaves it. But there is nothing in the first statement; and the correction for the second is that it should be ground moderately, and cold water poured into it, and it will become like milk, and then it should stand until it is thoroughly dry.

42. There are three kinds of aloes, namely citrine, the only one which is ordinarily used by the Latins; and hepatic, which looks like cooked pig's liver; and red.

43. Opiates are given only after purgation, in order to destroy the remaining humors, except in certain cases, for instance when there is little humor and when it is moving to some particular

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(48) SIMON DE CORDO, or JANUENSIS (d. 1305), physician to Pope NICHOLAS IV.

part of the body. For then it is better to draw back the humor than to suffer an important part to be destroyed. But it is not given in the correct proportion for that condition; and in the case of red opium which is given to check the heat in tertian fever, the results are not fortunate; nature seems to be destroyed and the man to fall into a frenzy.

44. Early *Antidotaria* begin with opiates, namely with *tyriaca* and others : then with electuaries : then with laxatives. SIMON saw the *Antidotarium* of COSMAS and DAMIAN in Italy and other early ones, and looked for the *Antidotarium* of ALAP which is in Hebrew, and the *Practica* of AVERROES (49).

45. The fermentation of drugs is of great value, for instance scammony should not only be pulverized and put into the medicine, since otherwise it will not be easily incorporated, but first it should be ground up in water until it has become like milk and then it may be incorporated with the medicine. In the same way, opium should first be ground up into water, then thoroughly dried, or mixed with honey.

46. Diagredium affects no illness except a humor such as choler and therefore in the *Benedicta* it is incorrectly given in the quantity of 5 drams, since 1 dram of scammony purges choler more than 1 ounce of hermodactyls and of those which purge phlegm. Therefore *Benedicta* purges not phlegm but choler : on account of this, the son of the man who made that *Benedicta*, added a large quantity of spurge and less scammony and called it *Benedicta transtiberina*.

47. The apotheme of the musk deer which has dropped naturally, has been scraped from the stomach of the animal and there are many grains, as many as a cube of grains, and it is reddish in color, and spherical in shape : that which is taken out before that time does not have mature grains; in the beginning there is a mass which looks like black coagulated blood; then nature divides that into twelve parts or about as many : then divides each of those into twelve, or about that number : and those who wish to adulterate it take some of that blood and mix it with

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(49) The *Antidotarium Opopira* was dedicated to COSMAS and DAMIAN according to ARNOLD OF VILLANOVA, *Opera*, 322, Lyon 1532. I have not been able to find out anything about Alap. *Practica* of AVERROES, Book V, Colliget.



some of the mature grains, and thus deceive people, but it is blacker in color and is not so aromatic.

48. Lign-aloes, which is called wood aloes, is of a somewhat black color inside and out, if it is good; it sinks in water if it is broken into small pieces, and is like knots in wood, and is in it, and is started in its veins; but those who wish to adulterate it boil the good aloes and extract the virtue, and sell to the Latins the pulp without its virtue, or some of the wood in which it was growing.

49. Rhubarb is put into a liquid, and its virtue taken out, and it is sent over to the Latins, that is, in one and one eighth *scutella* (50) of goat's milk, strained and boiled down with the whites of six or five eggs, above a flame, near to a moderate fire, in order that it may bubble gently until the cheese-like substance has all collected on top, and when it has been filtered again and well cooled, rhubarb which has been broken up into small pieces is poured into it, and the virtue is extracted in one short night in summer or a half of a night in winter, or about that much time, in order that it may be taken against cold humors, principally phlegm, and it should be filtered and well squeezed out so that all of the virtue may come out with the milk through a piece of fine cloth; and if it is again placed in a thin liquid and boiled vigorously, it is better than it was after the first straining. And better by far is rhubarb senith, that is Indian, than any other rhubarb: and if it is put in milk while it is warm, it will do nothing except ooze out. And one can drink the rest of the milk, and if weakened on account of fasting, which makes food pass from the stomach slowly, he can drink it and will void afterwards. And after he has taken this medicine, he should sleep for a little while, in order that it may better and more quickly pass from the stomach; but one should sleep for only a little while, that is, about an hour and a half or two hours, because if one sleeps too long it will evaporate through the body. A man can take one half ounce of the virtue of rhubarb. The rhubarb, which was mentioned in the second place, was *barbarum*, and that was

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(50) A *scutella* was a small flat vessel of rhombic shape. 'Scutula id est rhombus, quod latera paria habet nec angulos rectos', from PAULY-WISSOWA, *Realenzyklopaedie*, « scutella ».

heavy and its reddish color appeared to be dispersed throughout its entire substance; and therefore the doctors said that it was better because it was more moist, and could be more easily cut up into small pieces. *Reu senith* is lighter than *reu barbarum*, and *reu barbarum* is lighter than *reu ponticum*; and *reu senith* is rather black in color, and *reu barbarum* is always found with smooth surfaces and therefore seems to be boiled. *Reu ponticum* is always found to be round and rough and therefore does not seem to be adulterated nor boiled.

50. Rhubarb senith and others purge phlegm, and increase the natural heat and strength of the body, but rhubarb senith is better than any other. It is given in tertian fever against choler, but does not purge choler except incidentally, but does purge phlegm, as ARISTOTLE said in the *Secreta*. For choler is easily drawn out on account of its lightness, and it follows all the humors which are purged, as JOHANNES DAMASCENUS says in the *Afforismus* (51), that every laxative draws out choler; and therefore the doctors are deceived. Master S. calculates that its virtue is good against a flux of blood, because its marvelous virtue gives strength.

51. Flowers of rosemary are very good against phlegm and melancholy, and against the infirmities of old age. Small branches which come from a great branch of black hellebore, are taken and placed in water and the hard substance which is in those little branches is drawn forth and thrown away as poisonous; but the surrounding bark is collected and is prepared with other drugs, and it purges all choler and therefore cures quartan of its choler. In fact its seeds purge the humor which causes grey hairs, and is good against stone.

52. Myrobalans is broken up and placed in glass bottles in the strong sunlight, and water is poured over it, water which when it becomes bitter is put into another glass jar, such as a glass *scutella*, in the sunlight, and water is again poured over the myrobalans until it becomes bitter, and then it is poured into those *scutellae*, and this is done many times until the water remains sweet, and this water which has been collected in the *scutellae* is dried up in the sun. For the sun takes out all the water and

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(51) IANI DAMASCENI, *op. cit.*, *Aphorismus* 82, cf. note 8.

a gross substance is left which is called the virtue. Another method of extracting it is to place it in the sun, and a third method is to boil it down by fire. In a similar way turbith is prepared and its virtue extracted.

53. The root of the male peony is somewhat round, and the root of the female is somewhat spindle shaped covered with slender cones, and a great hump in the center; and powder is made from the root and placed with other things for paralysis because what passes over to the nerves and veins must be taken in food as JOHANNES DAMASCENUS desires in the *Afforismus* (52).

54. A good powder : take 1 dram each of castor and pellitory, 2 drams of cinnamon, and of grains of pepper, 1 dram of common salt, of the root of the female peony, and of the herbs penny royal and wild marjoram, and this is made into a powder. Moreover this powder is made in order that, according to the *Afforismus* of JOHANNIS DAMASCENUS, it may cross over into the fourth division and be changed in veins and nerves just as food is because otherwise the illness of the body is not cured. The root of the elecampane is cut up in round pieces and they are hung by a thread in the sun, in order that they may dry, because otherwise they would hold their moisture too long. This *pulegium* is not royal but is the true *pulegium*. For what in Francia is called *pulegium regale* is really wild thyme, like that found in Italy. The root of the long female peony is somewhat spindle shaped; this is not true of the male : who uses this may use it in food and drink.

55. Take 2 denarii of lign-aloes and it is best if it is thoroughly ground up by itself, and afterwards it is removed from the mortar. Then take 4 denarii of pearls; add 50 gold leaves, and grind them up together thoroughly, and when they have been well ground, add the powder of lign-aloes, so that it may become one substance : then it is removed; then put in 1/2 ounce of cloves and grind it up well : then everything is put in together and ground up well : then a Parisian obol (53) of musk is ground up by itself, then (bone of a stag's heart), if it can be secured, is ground up. Then take one half ounce of hard sugar and

(52) *Ibidem*, *Aphorismus* 60.

(53) An *obol* was equal to the sixth part of a dram.

grind it up by itself : then everything is put together and well ground up as this is the final quantity : then it may be easily kept.

56. Whoever uses gold should break it up very fine and pulverize it very minutely, and if they know how, should make it into a liquid and put it into milk or some other nutritive substance. Again, the gold leaves should be made very fine, and broken up very minutely : and also the pearls and the bone of a stag's heart and things of this nature : and the powder is made very fine and is put into milk or some other sweet thing or some such liquid, and is taken for faintness, and tremors of the heart and diseases of this kind, and against greediness, in cases where other maladies cannot be cured unless greediness is removed.

57. Mead is made of eight parts of water and nine of honey, therefore water is in an octupled proportion.

58. It is necessary that a doctor look up in the *Book of leprosy*, the putrid juices which come from four humors, either simple or compound according to their constitution.

59. These (drugs) are lacking among the Latins : red aloes which is called Indian, and Persian hepatic aloes which is citrine, just like the liver of a pig when it has been cooked; that which is called Arabic citrine aloes, which is black, is found among the Latins; and there is a certain succotrine aloes.

60. Epithymon of Babylon or of the island of Crete; rhubarb senith of India, because *reu barbarum* and *reu ponticum* are to be had : and it is difficult to distinguish between these three kinds of rhubarb. Whence sometimes in the books *reu senith* is called *barbarum*, and one is used instead of the other, because *reu senith* has not been correctly recognized : but that rhubarb is best for phlegm, and *reu ponticum rotundum* comes to the Latin countries. *Reu barbarum* has a smooth surface and is not round and therefore it is thought that *barbarum* cannot be taken for *ponticum*, or the virtue extracted by the Saracens. And *reu ponticum* is better than *reu barbarum*, and they are of the same price.

61. Lizard's dung is round and white and black in color; lizard's dung or theofic' are black grains which the people across the seas use in medicines for the eyes.

62. Oil of sesame, that is of a certain herb or tree or seed, is a common food beyond the mountains just like olive oil with us.

Also fresh balsam. Also good unadulterated musk. Also Indian wood aloes not boiled. Also viper's flesh from mountains which are not rocky, and by their teeth it is known whether they are male or female (54).

63. In the *Viaticum* it is called *diaquilon* when one takes equal amounts of scariola, and smallage, fennel, rock parsley, and this is good against cold dropsy and other things of this nature. Also pills of viper's flesh with spices and often with cinnamon is good for such dropsies.

64. The serpent (*draco*) which the Ethiopians alone know (55), and the snake (*coluber*) which has a red line on its back from the head to the tip of the tail and a red circle around its neck, and the viper (*tyrus*) are edible. But that snake is good against the diseases of old age and leprosy. However viper's flesh is by far the best for the diseases of old age, and is the drug of the poisonous variety concerning which HALY, etc.

65. Joyfulness, singing, the sight of human beauty, the touch of young girls, warm aromatic water, the use of spices and strengthening electuaries, bathing on an empty stomach after getting rid of the superfluities, protect and increase health and life.

66. Flowers of wild thyme are taken and put into a copper or iron or an earthen jar lined with lead, and the top is closed up, and smeared with ointment made from the whites of eggs and meal, and placed in a drinking cup or a cooking pot bubbling from morning up to the third hour or about that time, until it becomes an oily substance and the oil is squeezed out, and it is very good for cold humors.

67. Camomile is especially like the human constitution, as AVICENNA says (56), and if oil is made from it, as from the flowers, it is considered to be good against the diseases of old age. In the same way if oil is made from rosemary, it is certainly made from the flowers of penny royal, which is not wild thyme, used

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(54) AVICENNA, « Ars trochiscorum de viperis... Et eorum signum, quod masculi in omni latere habent unum dentem, et foemineae plures uno... », *op. cit.*, Liber V, I, 1.

(55) AVICENNA, « De dracone. ... Et dixerunt quidam, (cf. Aeti. lib. 4) quid ipsi multiplicantur in partibus Nubiae (Ethiopia) et Indiae, et Indi sunt maiores, et illi de Nubia, qui sunt in regione Asiae, sunt usque ad quatuor cubitos : et Indi sunt magni valde, » *op. cit.*, Liber, IV, VI, IIII, 53.

(56) AVICENNA, *op. cit.*, Liber II, II, 118.

in salts and with meat, but real penny royal having large fistules or branches, when the flowers have been placed in a jar of leadlined earth covered with a linen cloth, having been mixed with the whites of eggs and meal, are then placed in a pot or small vessel full of boiling water from morning until the third hour or about that time, and it is pressed and the oil which is thus made is very good for colds.

68. Flowers of camomile are taken and are ground up with olive oil, and the glass jar is refilled to the measure of an urn or one flagon almost up to the neck, and they are hung in a jar full of water, so that the circle of cloth or something else is about the neck, and a stone hangs down by a thread, not however down to the bottom of the vessel in which the water is, but the stone floats beneath the glass vessel and it holds it down. Then as the water is consumed by boiling, fresh water is poured in up to the top of the flowers : because it should always be up to the top of the flowers, and that water which is poured in should be cold, it seems to me, lest the glass vessel be broken, for experience has proved this.

*List of drugs mentioned by Bacon*

Those marked with the asterisk are discussed in the *Glossary of drugs* below.

BACON's method of spelling has been retained in all cases.

The numbers refer to the paragraphs in which each word is found.

\*Aloes, aloes, 40, 42, 59.

\*Aloes citrinus, yellow aloes, 10, 42, 59, 62.

\*Aloes epaticus, hepatic aloes, 10, 42, 59.

\*Aloes rubeum, red aloes, 42, 59.

\*Anacardum, fruit of an anacardiaceous tree, 6.

Antos, flos rosis marini, rosemary, 51, 68.

\*Apium, smallage, 63.

Apostema gazel, musk, 1, 10, 26, 47, 55, 62.

Aqua rosacea, rose water, 16.

Argentum, silver, 31.

Argentum vivum, quick-silver, 18, 31.

Aristologia de terra, birthwort, 10.

- Aurum, folium aurum, gold, gold leaf, 31, 55, 56.
- \*Balsamus, balsam, 1, 10, 27, 62.
- \*Benedicta, a compound drug, 7, 46.
- Benedicta transtiberina, a compound drug, 7, 46.
- Calce cumenon, copper, 31.
- Camomilla, camomile, 68, 69.
- Capit draconis, head of the dragon, 16.
- Carnes tyri, viper's flesh, 1, 4, 6, 10, 16, 27, 62, 63, 64.
- \*Cassia fistula, cassia, 40.
- \*Castoreum, castor, 54.
- Ciminum, cumin, 54.
- Cinamomo, cinnamon, 63.
- Coluber, serpent, 64.
- \*Diagridium, diagrideum, 7, 8, 46.
- \*Diaquilon, diachylon, 63.
- Draco, dragon, 64.
- Elleborus niger, black hellebore, 51.
- Enule, elecampane, 54.
- \*Epithimum de Babilonis vel de Creta, epithymon of Babylon, 60.
- Esula, spurge, 64.
- Feniculum, fennel, 63.
- Gariofli, cloves, 55.
- Hermodactilus, hermodactyls, 7, 46.
- Lapides pretiosi, precious stones, 31.
- \*Lignum aloes, xiloaloes, lign-aloes, 1, 4, 10, 27, 31, 48, 55, 62.
- Margarita, a pearl, 55, 56.
- Mel, honey, 40, 45, 46.
- Minium, red lead, cinnibar, 31.
- \*Mirobalanus, myrobalans, 4, 31, 40, 52.
- Mulsum, mead, 57.
- \*Muscus, musk, 1, 10, 27, 46, 55, 62.
- \*Oleum benedictum a lateribus, blessed oil of bricks, 16.
- Oleum olive, olive oil, 62, 69.
- Oleum sisami, oil of sesame, 10, 62.
- Opium, opium, 5, 8, 43, 44, 45.
- Origanum, wild marjoram, 54.
- \*Os de corde cerui, bone of a stag's heart, 1, 28, 55, 56.
- \*Petroleum citrinum, oil of Peter, or oil of rocks, 10.
- Petrosillium, rock parsley, 63.

- Pionie femine, feminine peony, 53, 54.  
 Pionie masculi, masculine peony, 53, 54.  
 Piperis rotundi, pepper, 54.  
 \*Piretrus, pellitory of Spain, 54.  
 \*Pulegium regale, penny-royal, 54, 68.  
 Pulegium verum, true penny-royal, 54.  
 \*Reu, rhubarb, 1, 3, 4, 16, 30, 49, 60.  
 \*Reu barbarum, 26, 27, 31, 49, 60.  
 \*Reu ponticum, Pontic rhubarb, 26, 27, 49, 60.  
 \*Reu senith, cenith, senith rhubarb, 10, 26, 49, 50, 60.  
 Rubea opiata, red opiate, 43.  
 Sal communis, common salt, 54.  
 \*Scamonea, scammonia, scammony, 5, 7, 41, 45, 46.  
 Scariole, endive, 63.  
 \*Sene, senna, 3, 30.  
 \*Serpillum verum, wild thyme, 54, 67, 68.  
 \*Squinanti, squinanth, 10.  
 Stercus lacerti vel theofic', lizard's dung, 61.  
 Sulphur, sulphur, 18.  
 \*Tamarindi, tamarind, 40.  
 \*Turbith, turbith, 52.  
 \*Tyriaca, a compound drug, 1, 6, 43.  
 Uzifur, cinnabar, 18.  
 Uzifur mineralis, mineral cinnabar, 18.  
 Viola, violet, 40.  
 Zuccarum durum, hard sugar, 55.

### *Glossary of drugs*

Aloes, *aloes*, a very bitter drug made from the inspissated juice from any one of several species of aloes. The best kind of aloes is the Socotrine most of which came from the island of Socotra. BACON's *aloes citrinus* was undoubtedly Socotrine, cf. AVICENNA, *Liber canonicus de medicinis cordialibus*, II, II, 64, Venice 1582, « Aloes quid est : Est succus congelatus inter rubedinem, et citrinitatem existens. Et eius aliud est succutrinum, aliud arabicum, et aliud est semegenium. Illud, quod melius est, est succutrinum : cuius aqua est sicut aqua croci, et odor eius est sicut odor myrrhae. »



Red aloes, *aloes rubeum*, is supposed to be a variety of Socotrine.

Hepatic aloes, *aloes epaticus*, was an opaque, liver-colored form of Socotrine.

Another medieval kind, not mentioned by BACON, was the *Aloe caballina*: « There are three several sorts of Aloes differing only in purity, viz. Aloe Caballina, Aloe Hepatica, Aloe Succotrina : the first is only given to horses : the second both to horses and men, this sort looks like liver : the last is the best, which being broken thin is transparent, and being powdred is of a good yellow colour. » *New London Dispensatory*, 154, London 1678.

Anacardus, *anacardus*, fruit of an anacardiaceous tree. The shell yields a blackish resinous juice. « Anacardus quid est : Est fructus similis ossi tamarindorum. Et medulla eius est similis medullae amygdalae dulcis, in qua non est nocumentum. Et cortex ipsius est rarus, perforatus, vel habens foramina, in cuius raritate est mel viscorum habens odorem. » AVICENNA, *op. cit.*, Liber II, II, 40.

Apium, *apium*, a form of wild celery (*apiaceae*), similar to smallage, « Aliud est montanum, et aliud sylvestre, et aliud domesticum : et aliud est, quod oritur in aqua et in loco aquae propinquo. » AVICENNA, *op. cit.*, Liber II, II, 55.

Balsam, *balsamus*, the balsam to which BACON refers must have been that which was cultivated by the Arabs around Mecca and sent from there by caravan to the apothecaries of Spain and other western European countries, cf. W. HEYD, *Histoire du commerce du Levant au moyen-âge*, II, 575-580, Leipzig, 1886. Balsam extracted from the fruit (*carpobalsamus*) or from the branches (*xylobalsamus*) was inferior to that obtained by incision (*opobalsamus*), and therefore much cheaper. According to HEYD *opobalsamus* was never mentioned in the books of commerce; but it is mentioned in the *Reichnauer Antidotarium* in the *Antidotus polichristus a Marcello acceptus*, edited by H. E. SIGERIST, Studien und Texte zur frühmittelalterlichen Rezeptliteratur, in *Studien zur Gesch. d. Med.*, H. 13, p. 41, Leipzig, 1923. This *opobalsamus* may have been the « pure balsam » advocated by BACON.

Benedicta, a compound drug. The *Benedicta Laxativa* or

*Benedicta Nicolai* used in Salerno. It consisted mainly of turbith, diagridium, hermodactyls, and other purging drugs. For two French translations of the *Antidotarium Nicolai* (NICHOLAUS PRAEPOSITUS) in which there are two recipes for the *Benedicta* see the edition by P. DORVEAUX, p. 6 and p. 108, Paris 1896.

Bone of a stag's heart, *os de corde cerui*, the following explanation of this term was kindly contributed by Dr. EDWARD KREMERS of the University of Wisconsin, « Ce n'est autre chose que le concours des artères dans la base du cœur, lequel par succession de temps s'endurcit, et dégénère en os. Il a une faculté spécifique pour fortifier le cœur, et pour le défendre de toute malignité, » from *Dictionnaire Pharmaceutique ou Apparat de Médecine, Pharmacie et Chymie*, 169, 1689.

From two other works of BACON we get a repetition of the ancient story that the medicinal value of the bone of a stag's heart is due to the astounding age to which it was possible for that animal to live, « Sed humiditas animalis longe vite non est sanguis, sed cartilago quedam que in corde eius invenitur. Nam dicitur quod hoc animal non ex senectute moritur, sed ex accidentibus aliis. Unde inventum fuit hoc animal in monte anonie, in cuius collo inventus est circulus in quo erat scriptum : Hoc animal fuit in hoc nemore positum tempore Iulii Caesaris. Et dicitur quod cor illius animalis sepe comestum naturalem calorem excitat et confortat. » *Incipit expositio predictae Epistole*, A. G. LITTLE and E. WITHINGTON, *op. cit.*, 88, and cf. 43. According to PLINY's theory stags had been known to live for at least a century.

Cassia fistula, this is not the cassia fistula of the ancient writers which was a bark related to cinnamon, but a cheaper variety of cassia (from the pulp of the pudding-pipe tree) akin to senna. F. A. FLÜCKIGER and D. HANBURY, *Pharmacographia*, 195-197, London 1874.

Castor, *castoreum*, a secretion of the beaver, having a strong odor. Used in medicine as an anti-spasmodic.

Diagredium, *diagridium*, a drug of the same family as scammony for which it was frequently substituted. HEYD, *op. cit.*, II, 670.

Diachylon, *diaquilon*, this was not like our diachylon but was a plaster made of the juices of several plants. « Lini semen emina, fenugreci emina, visci libra duo, rosa sicca libra una, malua saluatica radices ꝑ II, hec infundas in aqua sextar. XVIII et olei ꝑ III, spuma argenti ꝑ III, cera libra VI, decoquis lento igne et uteris. » *The Bamberger Antidotarium* (IX-X century), H. E. SIGERIST, *op. cit.*, 39.

Epithymon, *epithimum*, the flower of thyme. « Epithimum quid est : Est semen, et flos, et stypites parui frangibiles, et est calidum acuti saporis semina habens rubea, cuius plantae virtus est, sicut virtus alhasce, (thymi), verum halsce (thymum), est debilior eo, et dicitur, quod est de genere alhasce (thymi). AVICENNA, *op. cit.*, II, II, 225.

Lign-aloes, *lignum aloes*, the lign-aloes which was used in the Middle Ages was not the aloes used to-day, but was the resinous wood of the *Aquilaria Agallocha*. « *Agalochum, Lignum Aloes*, it comes to us in chips which are heavy, bitter, of a Blackish purple colour with ash coloured veins, of a sweet sent, and if they be good, they will swim when put into water. » *The New London Dispensatory*, 24. In the east it was used as incense but in the west, introduced by the Arabs, as a drug. F. A. FLÜCKIGER and D. HANBURY, *op. cit.*, 616, note 1. HEYD, *op. cit.*, II, 582.

Musk, *muscus*, a secretion of the musk deer. In the Middle Ages it was imported from India, Tibet, and China. Although rare in the west, it was frequently used by the doctors of Salerno. On account of its costliness it was seldom found among the articles of trade. HEYD, *op. cit.*, II, 639.

Myrobalans, *mirobalanus*, a fruit, similar to a prune, from trees which grew in India. A very common article of trade and frequently used in the Arabic and Salerno medical works. « Myrobalani quid est : Eorum alii sunt citrini immaturi : et alii sunt nigri Indi, et sunt illi, qui ultimi sunt in maturitate, et sunt pinguiore : et alii sunt Kebuli, qui sunt maiores omnium : et alii sunt sinii, qui sunt minuti et leviores. » AVICENNA, *op. cit.*, II, II, 449.

Oil of Bricks, *oleum benedictum a lateribus*, « Recipe Roots of Carduus and Valerian, ana ꝑ ii, flowers of Hypericon ꝑ ii : Wheat; ꝑ iss : very old Oyl ꝑ iiiii : Cypress Turpentine,

ξ viii : Frankincense poudred ξ ii : the Roots and Flowers being bruised, put to them white wine enough to cover them; digest two daies in a pot, then put in the Oyl with the Wheat beaten, which boyl together till the wine is evaporated : strain, and adding the Frankincense and Turpentine, boil again a little, and keep it ». *The New London Dispensatory*, 732.

Oil of Peter, or oil of rocks, *petroleum citrinum*, « It is a kind of fat flowing from Rocks or Stones : whether it be vegetable or mineral, it is doubtful; this is certain, that being inspissated it much resembles a gum. » *The New London Dispensatory*, 169.

Pellitory, *piretrus*, a very hot (Algerian) root, used for making a medicinal drink. DU CANGE, *Glossarium Mediae et Infimae Latinitatis*, « *piretrus* », V, 265, Paris 1845. It was later called pellitory of Spain.

Penny-royal, *pulegium regale*, the name comes from the Latin *puleium* (fleabane) because the plant was supposed to destroy fleas (*pulex*). « De mescatramescir, i. Dictamno et pulegio, Mescatramescir quid est : Stipites similes alasahesefram sicco ex quo non assumitur in principio cibi sapor plurimus neque odor, deinde succedunt amaritudo, et acuitas... Et est duarum specierum, quarum una est mescatha mesiha verum, et altera est mendosum falsum, et est ei simile : « AVICENNA, *op. cit.*, II, II, 461.

Rhubarb, *reu*, there does not seem to be any agreement among medieval writers concerning the different kinds of rhubarb. The younger Mesuë (d. 1015) says the rhubarb of China (the original home of the medicinal rhubarb) is better than *reu barbarum* (*reu officinalis*) or Turkish. Constantinus Africanus (d. 1087) says that Indian is better than Pontic Rheum. Most of the rhubarb used in the twelfth century probably came from India. According to Little and Withington senith rhubarb must have come from northern China, *op. cit.*, 223. For an interesting discussion of this question see F. A. FLÜCKIGER and D. HANBURY, *op. cit.*, 442-451.

Scammony, *scammonia*, *scamonea*, the juice from the root of the *convolvulus scammonia* plant. One of the most popular purgative drugs of the Middle Ages, that from Antioch being preferred. HEYD, *op. cit.*, II, 669-670.

- Senna, *sene*, the most popular purgative drug in the Middle Ages.  
 Wild thyme, *serpillum*, not like the present garden species. « De Nemem (Nemam) i. Serpillo vel sisymbrio, » AVICENNA, *op. cit.*, II, II, 507.  
 Squinanth, *squinanthi*, a grass of Northern and Central India from which an oil was made.  
 Tamarind, *tamarindus*, often called Indian date. A very popular drug among the Arabs and doctors of Salerno.  
 Turbith, *turbith*, a convolvulaceous tuber, allied to scammony, similar to Mexican Jalap.  
 Tyriaca, *tiriaca*, cf. our treacle. A very ancient and fashionable drug used by NERO, MARCUS AURELIUS and others. A recipe for it may be found in practically every *Antidotarium* of the Middle Ages, although each contains slightly different ingredients. Cf. *The Bamberger Antidotarium*, »... coloquintidu interiores dragma uiginti, aristologia rotunda, appii semen, spica nardi, petrosilino, croco, cassia ana dragma dece, trifolii acuti semen, cardamoni, etc. » H. E. SIGERIST, *op. cit.*, 29.

*A list of the authors and their works (those not in parentheses)  
 mentioned by Bacon*

- ALKINDI (AL-KINDĪ), (*De medicinarum compositarum gradibus investigandis libellus*), 33.  
 ALAP, *Antidotarium*, 44.  
 ARISTOTLE, *Analytica posteriora*, 39.  
 ARISTOTLE, *De plantis*, 21.  
 ARISTOTLE, (*De sensu et sensibili*), 19.  
 ARISTOTLE, *Elenchi*, 13.  
 ARISTOTLE (?) *Lumen luminum*, 22.  
 ARISTOTLE, *Metaphysica*, 13, 19, 31, 39.  
 ARISTOTLE, *Metheora*, 21, 31, 32.  
 ARISTOTLE, *Topica*, 13.  
 ARISTOTLE, *Secreta secretorum*, 3, 14, 16, 22, 26, 27, 30, 50.  
 AVERROES, *Practica*, 44.  
 AVICENNA, *Liber canonis de medicinis cordialibus*, 1, 3, 6, 8, 16, 17, 18, 22, 25, 30, 31, 34, 36.  
 CONSTANTINUS, 14.

GALEN, 14, 17, 22, *Dinamidiarum*, 31.

HALY ('ALĪ IBN 'ABBĀS), (*Liber regius*) 3, 14, 30, 36, 64.

HALY SUPER TEGNI ('ALI IBN RIDWAN) *Commentator, Galen, Microtegni*, 2, 29.

HIPPOCRATES, (*De aere, aquis, et locis*) 14.

ISAAC ISRAELI THE ELDER, 14.

JOHANNES DAMASCENUS, (SERAPION THE ELDER) *Therapeuticae methodi*, 3, 8, 50, 53, 54.

JOHANNES PLATEARIUS THE YOUNGER, (*Practica brevis*), 31.

MICHAEL SCOT, translations of ARISTOTLE, 21.

PLINY, (*Historia naturalis*), 21.

PTOLEMY, (*Quadripartitum*), 14.

RHAZES, (AL-RĀZĪ), (*Continens*) *Divisiones*, 14, 25.

SIMON DE CORDO, or JANUENSIS, 40, 50.

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